US009638497B2

(12) **United States Patent**
Summer et al.

(10) **Patent No.: US 9,638,497 B2**
(45) **Date of Patent: May 2, 2017**

(54) **IMPROVISED EXPLOSIVE DEVICE DEFEAT SYSTEM**

(71) Applicant: **HARRIS CORPORATION**, Melbourne, FL (US)

(72) Inventors: **Matthew D. Summer**, Melbourne, FL (US); **Paul M. Bosscher**, West Melbourne, FL (US); **John B. Rust**, Indialantic, FL (US)

(73) Assignee: **Harris Corporation**, Melbourne, FL (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 220 days.

(21) Appl. No.: **14/667,048**

(22) Filed: **Mar. 24, 2015**

(65) **Prior Publication Data**

US 2015/0345914 A1 Dec. 3, 2015

Related U.S. Application Data

(62) Division of application No. 13/267,357, filed on Oct. 6, 2011, now Pat. No. 8,996,244.

(51) **Int. Cl.**
G05B 15/00 (2006.01)
F41H 11/16 (2011.01)
(Continued)

(52) **U.S. Cl.**
CPC ***F41H 11/16*** (2013.01); ***B25J 3/00*** (2013.01); ***B25J 9/1633*** (2013.01); ***B25J 9/1689*** (2013.01);
(Continued)

(58) **Field of Classification Search**
CPC F41H 11/16; B25J 3/00
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,280,991 A 10/1966 Melton
3,637,092 A 1/1972 George et al.
(Continued)

FOREIGN PATENT DOCUMENTS

EP 0672507 A1 9/1995
EP 1 876 505 A1 1/2008
(Continued)

OTHER PUBLICATIONS

U.S. Appl. No. 13/627,357, filed Oct. 6, 2011, Improved Explosive Device Defeat System.
(Continued)

Primary Examiner — Adam Alharbi
(74) *Attorney, Agent, or Firm* — Fox Rothschild LLP; Robert J. Sacco; Carol E. Thorstad-Forsyth

(57) **ABSTRACT**

A robot system (**50**) includes a control system (**101**) having a control interface grip (**102**). The robot system includes a macro robotic arm (**54**) and a micro robotic arm (**60**). The robot system is arranged such that the macro robotic arm will respond, in a first control system state, to movement of the control interface grip. In particular, the macro robotic arm will move in a plurality of directions responsive to corresponding movement of the interface grip. The micro robotic arm will respond, in a second control system state, to movement of the control interface grip. In particular, the micro robotic arm will move in a plurality of directions responsive to corresponding movement of the interface grip.

28 Claims, 6 Drawing Sheets